AMERICAN MUSEUM NOVITATES

Number 612 Published by The American Museum of Natural History New York City May 8, 1933

59.7, 57 P: 15.6

REPRODUCTION AND EGGS OF *POMACENTRUS LEUCORIS* GILBERT

By C. M. Breder, Jr., and C. W. Coates[1]

On May 2, 1930, twenty-six specimens of *Pomacentrus leucoris* Gilbert collected at the Galapagos Islands on the first 'Nourmahal' expedition[2] were brought to the New York Aquarium by Mr. Vincent Astor.

This species is at least as quarrelsome in the relatively close confines of an aquarium as its better-known Atlantic relatives, and as a result of this disposition the twenty-six specimens were reduced to two by the beginning of 1932. Even the placing of a relatively large species (*Spheroides maculatus* Bloch and Schneider) in the aquarium caused such strong resentment that it was necessary to remove the latter in the interests of peace.

The two fishes that remained proved to be of opposite sex, and with the aquarium (4′×3′×3½′ deep) to themselves they soon engaged in egg-laying. As there is little recorded on the reproduction of the Pomacentridae, and since there is little likelihood of further observations being made on this species in the near future, the reproductive behavior and the physical appearance of the peculiar eggs are here discussed.

The actual courtship and "nest building" may be described as follows. Both fishes were observed carrying mouthfuls of sand to a protuberance of rock in the aquarium and blowing it out in a cloud so that some of the sand settled on the rock, and the rest rolled off. After several mouthfuls of the sand had been carried up in this manner, from the floor of the aquarium, the fishes "fanned" vigorously with their fins, and then with their mouths picked off the few remaining grains of sand from the rock. After several efforts of this kind, they abandoned this site and chose another jutting ledge of rock which was treated to a similar scouring of sand. This, too, proving unsatisfactory, still other sites were selected until a dozen or more had been tried before one was found to suit. All of these abandoned sites were plainly visible for a short while, since traces of sand were left at each one.

[1]Of the New York Aquarium.
[2]See Townsend, C. H., 1930, Bull. N. Y. Zool. Soc., XXXIII, No. 4, for details of this expedition.

The place finally chosen for the eggs was treated in the same manner, but the sanding and fanning were carried on for several hours, each fish working industriously all the while. One fish, however, seemed to show more activity than the other; this probably was the male. After the surface of the rock had been thoroughly cleaned, the female swam over it with her ventral surface touching the face of the rock, and the ovipositor plainly in view. She left a more or less concentric circle of eggs adhering to the rock over which the male swam, following the female very closely both in time and movement. The eggs were deposited during a number of spawnings, each taking from ten to thirty minutes to complete, with a varying length of time between. These intervals of rest between the spawning ranged from a few minutes to several hours and seemed to be acceptable to both the male and female, although, at these times, the fish were excited and restless, continually darting about the tank.

Owing to its distance from the glass wall, it is not possible to say how many eggs were deposited in the nest, either for the total, or for each actual spawning period; but, from a comparison of an egg to the space covered, the entire number approximated four or five hundred.

The above-mentioned ovipositor protruded about one-eight of an inch and was about the same in diameter, or a very little larger. It was white and flat at the end, and may be nothing more than the lips of the genital pore pressed outward by the mass of eggs within. The male fish exhibited a similar structure, except that it was not so wide and was pointed at the end. The point was slightly inclined toward the head of the animal. Whether this is not a necessary protrusion, or whether the fishes swam at a slight angle occasionally, this protuberance was not always visible during the spawning.

After the eggs were once deposited, the care of them was not unlike that exhibited by a variety of other fishes that circulate water for such purposes. This process has already been briefly described and illustrated with two photographs, but it may here be expanded in greater detail. The photographs published in the former article[1] show the second spawning; illustrations in the present paper picture the third spawning.

Both fish were in constant attendance on the eggs, one of them usually immediately above the egg-covered rock, the other hovering nearby. They moved with quick jerky darts to one side or the other. The fish above the eggs continually fanned them, particularly with the pectoral fins. This fanning seemed to rock the fish in a peculiar lateral

[1]See Breder, C. M., Jr. 1932. Bull. N. Y. Zool. Soc., XXXV, No. 4, pp. 120–121.

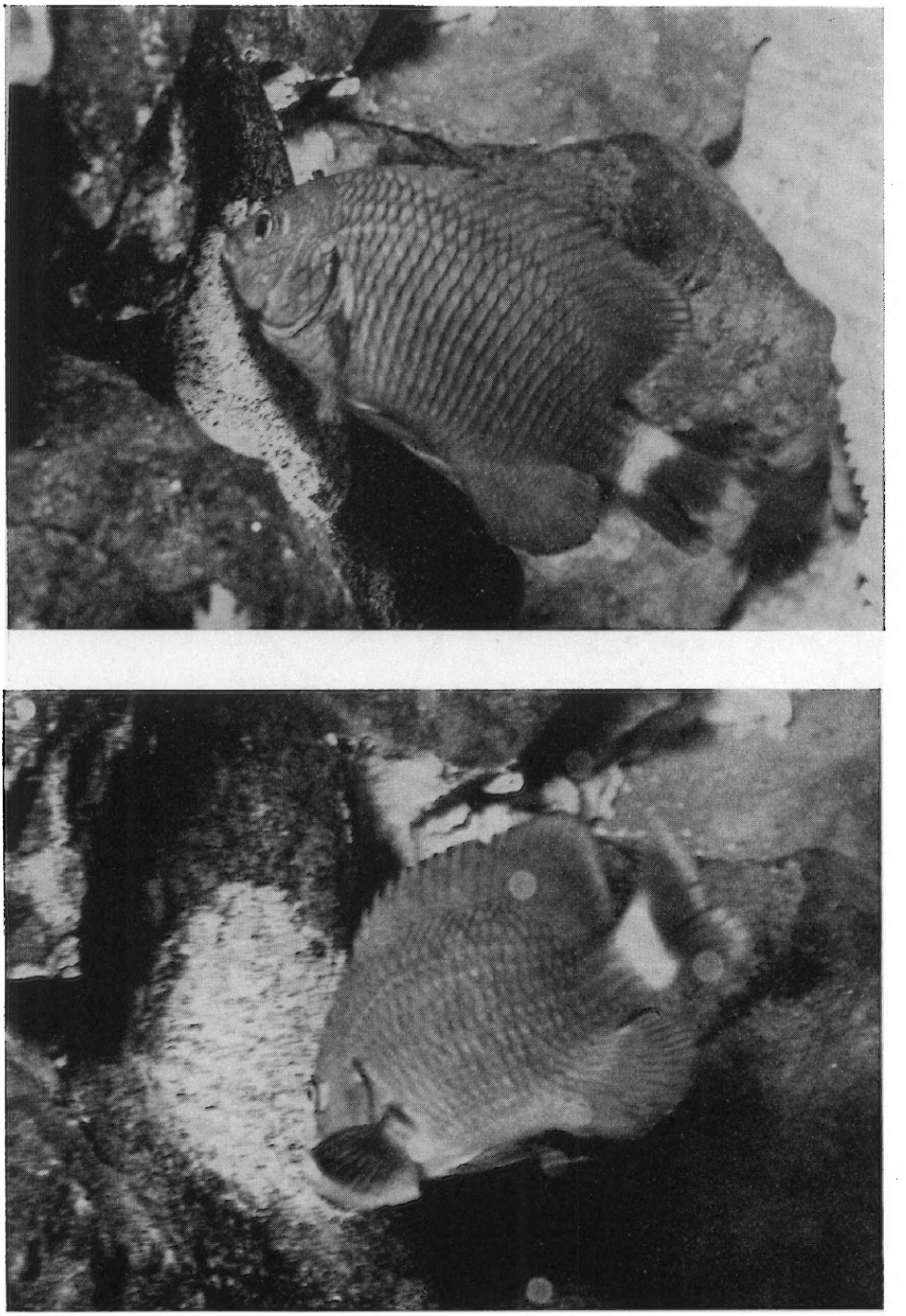

Fig. 1. *Pomacentrus leucoris* in two typical postures while tending its eggs. Photographs by S. C. Dunton.

motion. If one fish left the eggs, the other almost immediately took its place. While correct identification of the sex of the fish was not always possible, the male was apparently most active in the care of the spawn. Occasionally the fish in attendance would pick over the spawn, seemingly sorting out unfertilized or dead eggs.

In all, three batches of eggs are known to have been deposited be-

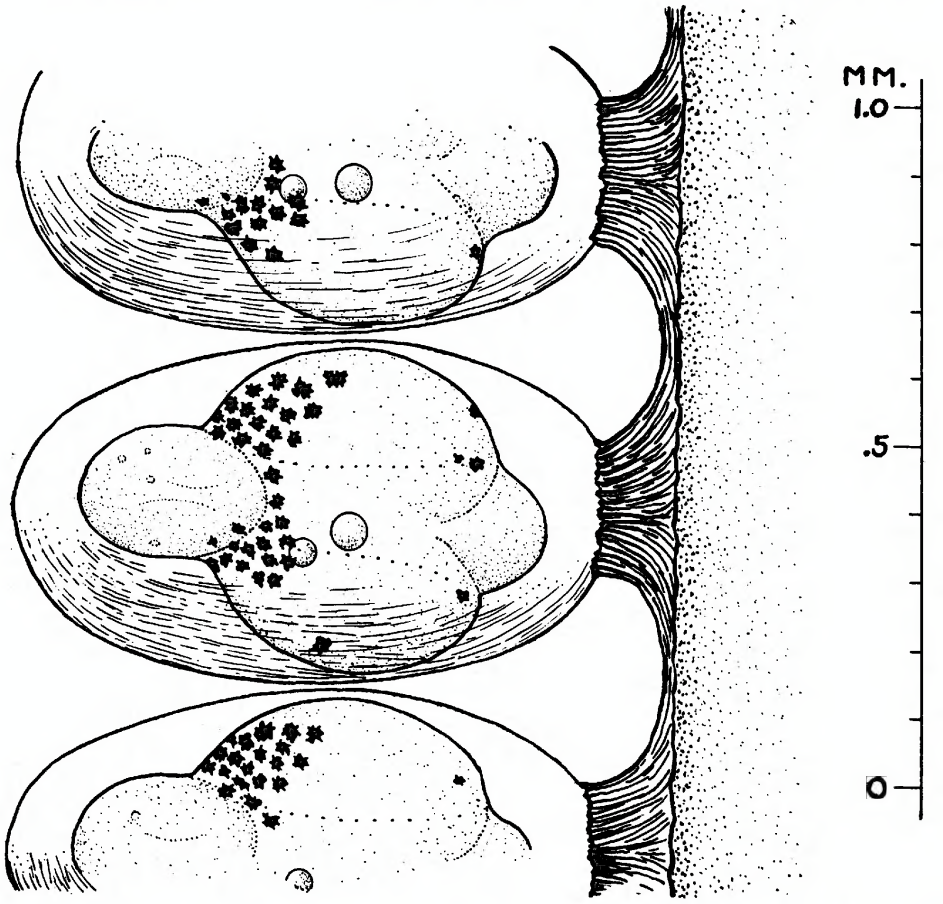

Fig. 2. Eggs of *Pomacentrus leucoris*, fifty-one hours after spawning, showing attachment to a vertical surface. Semi-diagrammatic.

tween early spring and August 13, indicating a considerable gonadal activity on the part of these fishes. As is not uncommon with such animals, in captivity at least, the first two batches were eaten by their parents on the following day. To forestall this the parents were removed after the third spawning.[1] This occurred at 11:00 A.M., August 13, and

[1]Unfortunately one died, apparently as a result of an accident in handling, which forced a termination to this study.

it forms the chief basis of the preceding description of spawning behavior. On the 15th a few of the eggs were removed for examination. Their condition at 2:00 P.M., fifty-one hours after spawning, at a temperature of 72° F., is shown in figure 2 and indicates the well-advanced condition of the embryos. These eggs may be described as follows: they are evenly elliptical in form, the long axis not quite twice that of the short, the former ranging from about 0.8 to 0.9 mm. with an average a little over 0.85, the latter ranging from about 0.4 to 0.5 with an average a little over 0.45. The surface of the shell is entirely covered with fine longitudinal striae, as indicated in figure 2. At this stage there is no evident perivitelline space. The yolk, principally about the head-end, is freckled with black chromatophores, thus forming something of a "collar" about the embryonic "throat" region. The yolk is slightly tinted with amber, which hardly differentiates it from the somatic portions. The oil-globules, usually two in number, unlike those of most fish-eggs, are either colorless or exactly match the pale yolk. Viewed by transmitted light the oil globules are less refractive than any others known to us.

The most striking feature of these eggs is their method of attachment. From one pole numerous closely packed tendrils depend, which in a single detached egg resemble somewhat the condition found in *Menidia*. However, when a group of eggs is examined, it becomes apparent that these tendrils are so interlaced, or continuous, that each egg is connected with its neighbor. Thus each egg stands on a small pedestal when the common footing is applied to a flat surface. So far as this feature is concerned, figure 2 is a semi-diagrammatic reconstruction showing how the eggs were originally attached to their rock-support. The eggs are very evenly spaced, and it will be noted that they are almost, but not quite, in contact with one another. As these eggs were attached to a vertical wall and not tilted either upward or downward, except as originally described when a parent fanned them, it follows that they must have substantially the specific gravity of the water in which they were immersed.[1]

The head of the embryo in each egg examined was directed away from the base. The eggs removed for examination failed to hatch. Those in the aquarium hatched on the 17th. The larval fish could be seen moving about near the broken shells. In a few days none were to be seen. The reason for this we were unable to ascertain.

[1]For other reasons not concerned with this study the specific gravity was carried unusually high (1.0297).

It is known that the Atlantic species *Pomacentrus leucostictus* Müller and Troschel usually places its eggs in large empty shells, such as those of *Strombus*. Such nests are abundant in the shoal waters of the Dry Tortugas, Florida. Many were found here in the summer of 1929, at the laboratory of the Carnegie Institution of Washington. Although there were no shells present in the aquarium in which *P. leucoris* spawned, the rock-work on the walls provided a large choice of surfaces. Many cavities were large enough for the fishes to hide in completely; but none of these was selected for egg-laying, though each batch of eggs was placed on an exposed, approximately vertical rock, which presented a scarcely perceptible concavity. This is well illustrated in the photographs already published.[1] Very likely this difference in choice of nesting sites between *P. leucostictus* and *P. leucoris* is a real one and not merely induced by the condition of captivity.

[1]Breder, *loc. cit.*